

## CORRESPONDENCE

Research  
Correspondence

## Athletes With Abnormal Repolarization Pattern and Structurally Normal Heart Can Participate in Competitive Sport A Lifelong Experience

**To the Editor:** Athletes with markedly abnormal repolarization pattern (instinctively suggesting the presence of cardiac disease, such as hypertrophic cardiomyopathy [HCM]), in the absence of any patent structural cardiac abnormality, represent a challenging responsibility in the contemporary cardiology practice. There is evidence, in fact, that such abnormal electrocardiograms (ECGs) deserve careful diagnostic scrutiny and continued clinical surveillance, because they might represent the initial and often sole expression of underlying cardiomyopathies, not clinically evident until many years later but associated with adverse outcome (1). Therefore, at present, the appropriateness to clear athletes with such markedly abnormal pattern for competitive sport (which potentially increases the risk of cardiac events [2]) is largely debated. For this reason, we believe the case here described is informative.

Alberto, 29-year-old man and asymptomatic professional soccer player, was initially referred to the Institute of Sport Medicine (Rome) in 1971, because of an abnormal ECG, showing diffusely, deeply inverted T waves in precordial and standard leads (Fig. 1A). The physical was unremarkable, family history was negative for cardiac events, and exercise testing (peak heart rate, 188 beats/min) showed “normalization” of the repolarization.

Outstanding cardiologists were consulted to solve the intriguing case of the athlete “in excellent physical condition with the solitary exception of the abnormal electrocardiogram” (3). After repeated evaluations and conflicting considerations, Alberto was allowed to resume professional soccer, by passing serial evaluations until the age of 38, during which period the ECG pattern even worsened (Fig. 1B). The M-mode echocardiogram (1979) showed normal left ventricular (LV) dimensions (diastolic dimension = 48 mm, maximum wall thickness = 12 mm) and function.

At age of 55 years, he was still asymptomatic but sedentary, overweight, and a smoker. The ECG showed partial regression of the repolarization abnormalities (Fig. 1C). Exercise testing was negative for symptoms, with repolarization pattern normalizing during exercise. Echocardiogram showed normal LV dimensions (diastolic dimension = 50 mm; maximum wall thickness = 11 mm) and normal systolic and diastolic function.

In 2008, at the age of 66 years, Alberto experienced chest pain, was promptly transferred to a local hospital, had coronary angiography, and underwent an efficient revascularization of a culprit lesion on the right coronary artery. No lesions were found in other coronary vessels. The ECG developed Q waves in leads III and aVF.

At present (2011) the patient, 69 years of age, is asymptomatic, sedentary, and overweight. The ECG shows Q waves in inferior

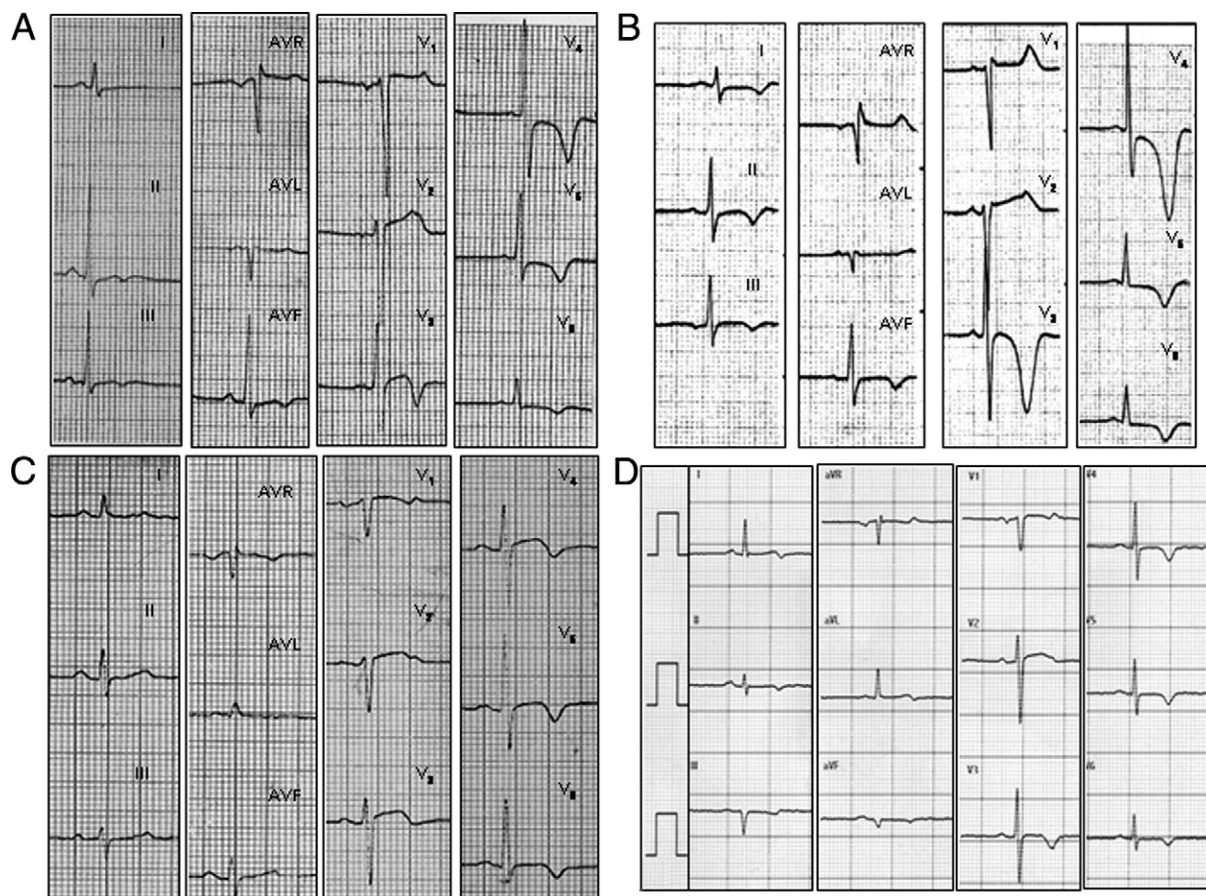
leads and the usual abnormal repolarization pattern (Fig. 1D). The echocardiogram shows unchanged cardiac dimensions but evidence for diastolic dysfunction; the cardiac magnetic resonance imaging recently performed confirms the normal LV morphology, in the absence of LV hypertrophy, even segmental.

The case here described, representative of the subset of athletes with favorable outcome we previously reported (1), clearly demonstrates that an abnormal repolarization pattern might be present for a prolonged period of life, without incidence of symptoms or phenotypic development of cardiomyopathies, namely HCM. This case supports the view that certain individuals, despite a horrific ECG, might have a normal life, including participation in competitive professional sport.

We learned from this lifelong observation that solitary repolarization abnormalities do not represent sufficient criterion for clinical diagnosis of cardiomyopathies and should not be considered, per se, as a disease condition. We do not believe that the abnormal repolarization pattern here described is just a “normal” ECG variant. We had no access to deoxyribonucleic acid analysis to ascertain the presence of abnormalities associated with HCM (or other cardiomyopathies) and therefore cannot exclude that this athlete might be a genotype-positive, phenotype-negative individual. This case suggests the possibility that certain individuals without HCM phenotype at old age might represent a subset with markedly delayed or nonpenetrant gene mutations. Such individuals might ultimately not ever develop overt HCM phenotype and might have a benign clinical outcome.

We do not know the mechanisms by which the ECG repolarization pattern in our case was so abnormal and indistinguishable from those associated with development of HCM phenotype and/or incidence of cardiac events. Therefore, we do not want to reduce the level of attention and clinical suspicion in athletes with deeply and diffusely inverted T-wave, who deserve a careful clinical and imaging investigation and periodical follow-up (1). However, we were reassured from this experience that a subset of athletes with abnormal repolarization pattern are not ever going to develop cardiac disease and, reasonably, should not be restricted from participation in competitive and professional sport.

Our observations have relevance to pre-participation screening in athletes. On the basis of the present case, it seems justified on clinical, ethical, and legal grounds to allow an athlete with isolated abnormal repolarization pattern (after a careful diagnostic course has excluded inherited cardiac disease) to continue in his/her competitive sport with the recommen-



**Figure 1** Electrocardiogram

(A) Age 29 years: marked repolarization abnormalities, with ST-segment depression and T-wave inversion in lateral precordial and standard inferior leads. (B) Age 37 years: marked ST-segment depression and deeply inverted T waves in the lateral precordial and standard inferior leads. (C) Age 56 years: T-wave inversion persists in precordial antero-lateral leads. Notice reduction in voltages of R/S-wave in precordial and standard leads. (D) Age 69 years: unchanged repolarization pattern. Q-wave in standard inferior leads, consequence of the myocardial infarction.

dation of periodical follow-up, as appropriately stated by the current recommendations (4,5).

**\*Antonio Pelliccia, MD**

Institute of Sports Medicine and Science  
Largo Piero Gabrielli, 1  
00197 Rome  
Italy  
E-mail: [ant.pelliccia@libero.it](mailto:ant.pelliccia@libero.it)

**Fernando M. DiPaolo, MD**

**REFERENCES**

1. Pelliccia A, Di Paolo FM, Quattrini FM, et al. Outcomes in athletes with marked ECG repolarization abnormalities. *N Engl J Med* 2008; 358:152-61.
2. Corrado D, Basso C, Rizzoli G, Schiavon M, Thiene G. Does sport activity enhance the risk of sudden death in adolescents and young adults? *J Am Coll Cardiol* 2003;42:1959-63.
3. Venerando A, Rulli V. Frequency morphology and meaning of the electrocardiographic anomalies found in Olympic marathon runners and walkers. *J Sports Med Phys Fitness* 1964;4:135-41.
4. Maron BJ, Zipes DP. 36th Bethesda Conference: recommendations for determining eligibility for competition in athletes with cardiovascular abnormalities. *J Am Coll Cardiol* 2005;45:1373-5.
5. Pelliccia A, Fagard R, Bjornstad HH, et al. Recommendations for competitive sports participation in athletes with cardiovascular disease. *Eur Heart J* 2005;26:1422-45.